# Digital Atolls

## (Re-)Sensing the South Pacific in Times of Climate Change

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Die südpazifischen Inselstaaten Kiribati und Tuvalu stehen der Klimakrise besonders prekär gegenüber: Bereits in 40 Jahren soll ihre gesamte Landfläche mehrmals jährlich überschwemmt werden. Vor diesem Hintergrund wurde *Tuvalu, First Digital Nation* ins Leben gerufen. Durch die Öffnung eines virtuellen Raums bewahrt das Projekt nicht nur gefährdete (Meeres-)Landschaften für künftige Generationen, sondern sichert verschiedene Identitäten, die untrennbar mit diesem geografischen Gebiet verbunden sind. Tuvalus Digitalisierung ermöglicht zum einen eine staatsbürgerlich-rechtliche Identität zu bewahren, die aufgrund aktueller Definitionen von Staatlichkeit verloren gehen würde, zum anderen wird eine soziokulturelle Identität erhalten, die zutiefst mit einem verschwindenden geografischen Raum verflochten ist. Als virtuelle Umgebung könnte das Projekt so einen Raum eröffnen, in dem geografische Gebiete weiterhin wahrgenommen und erfahren werden können, obwohl diese physisch nicht mehr existieren.

> What will happen when our nation Kiribati is swallowed by the vastness of the Pacific Ocean?
> Our community and what is close to our hearts will cease to exist, because it is all inextricably linked to our home soil.
> Our families are the core of our being.
> If our families shatter due to climate change, our culture, our language, our dances and our entire heritage will be lost irretrievably.
> Yes, I am worried about the uncertain future of my homeland.[1]
> *Aborina Tenanorake Stellmach*

1 Recording and transcript of a speech held by Aborina Tenanorake Stellmach for the piece *Ti a boo* at the Staatstheater Braunschweig, 2021. Translation by Angela Fischer and D. Castillo. See Fig. 1 for the audio recording of the speech.

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“What will happen when our nation Kiribati is swallowed by the vastness of the Pacific Ocean?” This question is raised by Aborina Tenanorake Stellmach, the I-Kiribati woman you just listened to in the recording (see Fig. 1). It’s a question that leads to a myriad of thoughts on precariousness and global injustices. It’s a question that you might find discomforting to engage with, a question that forces you to face the effects of global warming. It might even be a question that genuinely invites you to rethink your carbon footprint. But it’s not. This question is not about liability. Aborina Tenanorake Stellmach does not intend to discuss climate mitigation with you, she simply wants to know: “What will happen when our nation Kiribati is swallowed by the vastness of the Pacific Ocean?” What will betide her community, her family? What will occur to the atoll nation’s culture(s), its language(s), its dances? Aborina Tenanorake Stellmach is worried that families will shatter, that heritages will be irretrievably lost. Her question is an invocation to imagine ways of preventing such a rupture. And her question is an encouragement to envision vigorously.

Fig. 1: Recording of a speech held by Aborina Tenanorake Stellmach for the piece *Ti a boo* at the Staatstheater Braunschweig, 2021.

Audio: https://doi.org/10.48620/97269
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## Climate Change and the South Pacific

Aborina Tenanorake Stellmach knows from personal impressions that global warming is already having multiple impacts on her atoll nation Kiribati. Her experience of climate change is coined substantially by embodied and spatial practices. As Aborina Tenanorake Stellmach remembers, she crossed as a child and on a daily base the ocean, visiting friends and family on other islands during low tide.[2] She forded the ocean on foot, walking coral reefs that connected islands like Betio and Bairiki to each other. Nowadays, the practice of strolling the ocean becomes more and more uncommon. On Tarawa, the capital atoll of Kiribati, rising sea levels forced the government to build elevated motorways between islands so that I-Kiribati can continuously visit their friends and families (fig. 2). Aborina Tenanorake Stellmach might keep on roaming the ocean, but no longer on foot. It’s through such embodied and spatial practices – or through their loss – that Pacific Islanders experience the effects of climate change particularly on a sensorial and corporeal level.

Small island communities and ecosystems are exceedingly vulnerable to global warming, and rising sea levels is just one existential threat that island nations are facing. As the Intergovernmental Panel for Climate Change

2 Conversation with Angela Fischer on April 21, 2021, in Brunswick (Germany).

Fig. 2: The islands Betio (center) and Bairiki (bottom right) connected by a motorway. South Tarawa, Kiribati, © ESA, 2020.

(IPCC) emphasized in its *Sixth Assessment Report*, small islands in the South Pacific are highly affected by increasing water temperatures, which induce more frequently tropical cyclones, sea level rise, coral bleaching, and the nidation of invasive species.[3] Especially for atoll nations like Kiribati, whose islands depend on intact coral reefs and sound mangrove root systems to prevent erosion, coral bleaching and increasing soil salinity pose acute risks.[4] However, global warming not only endangers settlements and infrastructures on atolls: it also compromises its inhabitants' health and well-being since water and food security cannot be safeguarded in the long run without relying on import, thus straining economy and culture.[5] Considering the low-coastal profile of Kiribati, annual flooding of the entire terrestrial surface is expected from the 2060s on, amplifying the vulnerability of its population.[6] The IPCC concludes that "communities in small islands, especially those relying on coral reef systems for livelihoods, may exceed adaptation

3 Cf. Michelle Mycoo et al.: "Small Islands", in: *Climate Change 2022. Impacts, Adaptation and Vulnerability*, ed. by Hans-Otto Pörtner et al, Cambridge UK/New York: Cambridge University Press, 2022, 2043–2121, here 2045. https://doi.org/10.1017/9781009325844.017

4 Cf. Mycoo, "Small Islands", 2052.

5 Cf. Mycoo, "Small Islands", 2045.

6 Cf. Mycoo, "Small Islands", 2046.

limits well before 2100 even for a low greenhouse gas emission pathway"[7]. To maintain the ability of atolls to support life, climate mitigation strategies are required that foster the active extraction of carbon dioxide from the atmosphere – the sole reduction of carbon emissions will simply be insufficient.[8]

It's with this uncanny background that Aborina Tenanorake Stellmach worries about the uncertain future of her homeland. The effects of global warming are palpable, and she knows that forced migration is inevitable if the international community continues to stand idly by. Aborina Tenanorake Stellmach wonders how the shattering of families can be impeded once the process of relocation starts, how culture(s) and heritage(s) can be saved. This article cannot answer the concerns on the well-being and dignity of her nation's citizens, nevertheless, it draws on how to preserve the culture(s), language(s) and dances she fears will be lost irretrievably. The next section introduces a digital project that, in times of climate change, sustains identities linked to vanishing geographic areas. While still in its development phase, it proposes to open up a virtual space so vulnerable sea- and landscapes can persist in future. The project explores how physical spaces in the South Pacific can be re-sensed once they cease to exist.

## Digitizing Atolls

The Republic of Kiribati might be the most prominent example of a modern nation that will lose its landmass due to global warming. However, there are many more sovereign nations located in the South Pacific that face similar threats and already experience the effects of climate change to the same extent. One of those atoll nations is Tuvalu, who announced at the 2022 United Nations Climate Change Conference (COP27) an ambitious plan to replicate its entire territory in a large-scale digital project. The migration of Tuvalu into the virtual realm was introduced with a video statement by Simon Kofe. The Tuvaluan Minister of Justice, Communication and Foreign Affairs at that time started his speech by pointing out that he already addressed his nation's uncertain future in previous UN Climate Change Conferences. Nonetheless, the global collaboration promised to end climate crisis never came into existence: "Since COP26, the world has not acted, and so we in the Pacific have had to act. […] As our land disappears, we have no choice but to become the world's first digital nation."[9] With this declara-

7 Mycoo, "Small Islands", 2046.

8 Cf. David Castillo/Kai Schulz: "Reimagining the Ocean in Times of Climate Change", in: *Rethinking the Global*, by Center for Global Studies, University of Bern, Podcast 26/05/2025, 00:01:20–00:02:45, https://open.spotify.com/episode/3yiAqbbkl6RZCnPlBiwqlZ (03/03/2026).

9 Simon Kofe: "COP27 Speech", in: *YouTube*, 15/11/2022, 00:00:33–00:00:58, https://www.youtube.com/watch?v=lXpeO5BgAOM (12/04/2025).

tion, the governmental project *Tuvalu, First Digital Nation*[10] was presented to a global audience consisting of political authorities. For one thing, the project entails the preservation of cultural and social identities tied to a disappearing geographic area. By collecting and digitizing voices and life stories, cultural events and artifacts, as well as social practices and traditions embedded within a specific land- and seascape, the platform allows Tuvaluans to roam and revisit a cultural and social space virtually once it has been engulfed by the Pacific Ocean. Needless to say, that such a space will never replace the physical one, and yet it initiates a community-led process of archiving cultural heritage(s) for coming generations. The loss of embodied cultural practices might be inevitable, but archives carry the opportunity to restore and revive some of those cultural practices in the distant future. Having said that, another central promise behind *Tuvalu, First Digital Nation* can be found in the political and juridical value it holds for the atoll nation on a governmental level. Migrating a modern nation's territory into virtual space might allow a nation to sustain its nationhood, statehood and sovereignty even if its territory ceases to exist. Digitizing Tuvalu's geographic area therefore not only enables future Tuvaluan generations to maintain a cultural and social identity that is entangled with a vanishing physical space; it also perpetuates a civic and legal identity that otherwise would be lost due to current legal definitions of statehood that require sovereign nations to dispose over a defined territory to exist.

Kofe raised a lot of furore and curiosity when he heralded that the physical space Tuvalu would be gradually migrated to a cloud, allowing the Tuvaluan government to proactively preserve the cultural, social, legal and civic identities of Tuvaluan citizens. However, his announcement at the COP27 in 2022 left many practical questions unanswered since the project was just taking off and still in its conceptional phase. Details on the tools implemented in the digitization process, as well as details on the accessibility of the virtual space were not provided at that time. On that score, Kofe updated the international audience at the 2023 United Nations Climate Change Conference (COP28), giving some tangible insights into the transformation his nation was enrolled in. A major novelty disclosed in the project status report concerned the mapping of the atoll nation. As Kofe ensured, his government had "completed a detailed, three-dimensional LIDAR scan of the entire country – all 124 islands and islets that make up Tuvalu."[11] Since LIDAR is a method for creating digital elevation models of terrestrial and maritime areas,[12] not only Tuvalu's islands and islets were mapped with high

10 Ministry of Justice, Communications and Foreign Affairs of Tuvalu: "The First Digital Nation", https://www.tuvalu.tv (14/04/2025).

11 Simon Kofe: "COP28 Update", in: *YouTube*, 04/12/2023, 00:01:11–00:01:22, https://www.youtube.com/watch?v=m0KoYarxX3E (14/04/2025).

12 Lucian Haas: "LIDAR-Archäologie. Menschheitsgeschichte im Laserscan", in: *Deutschlandfunk*, 01/05/2022, https://www.deutschlandfunk.de/lidar-archaeologie-roemer-maya-khmer-100.html (14/04/2025).

accuracy – also its coastal zones, reefs, lagoons, and sea floors will persist virtually. The government's choice to create a three-dimensional scan of its land- and seascapes harbours a remarkable potential for the way coming Tuvaluan generations experience their atoll nation on a corporeal level. Even though sensing a geographic area in a virtual space differs profoundly from sensing it in a physical one, a virtual model of Tuvalu enables its citizens to engage through embodied practices with their homeland, even if it ceases to exist physically. However, the mode of sensing shifts: in the digital realm, a body experiences an environment predominantly through sight- and hearing-based practices, whereas touch-based practices are less central.

With the three-dimensional scan, the migration of Tuvalu's geographic area into a cloud seemed finalized. Albeit providing detailed information on the specific tools used to digitally map the atoll nation, the project status report in 2023 did not address how or for whom the digital model of Tuvalu would be accessible. Until this day, vagueness and the lack of conceptual clarity trail the virtual nation's display and availability, intensified by the fact that the Tuvaluan Minister of Justice, Communication and Foreign Affairs resigned in 2023.[13] Ever since, the project has not been publicly promoted, nor has there been any official updates or progress reports. Due to this fissuring in the flow of information, Tuvalu's process of becoming a virtual nation is on hold. It remains unknown if the Tuvaluan government plans on further developing the digital elevation model, turning it as pronounced into a virtual reality space – a so-called metaverse. In an imagined future, Tuvalu could not only become the first digital nation, but it would also become the first virtual world in which people are able to bodily interact through virtual reality headsets with already submerged land- and seascapes. As a virtual reality environment, *Tuvalu, First Digital Nation* could open up a space for Tuvaluan citizens to re-experience and re-sense terrestrial and maritime zones that are no longer physically palpable and tangible, but nonetheless inextricably tied to their cultural, social, legal and civic identities. Of course, this virtual environment will never make up for the loss of physical spaces and the cultural practices embedded within. Yet, archiving cultural practices unfolds as a form of climate adaptation, promising atoll communities a possible way of conserving their culture(s) and heritage(s).

## Re-Imagining Future(s)

This article embarked with a question raised by Aborina Tenanorake Stellmach: "What will happen when our nation Kiribati is swallowed by the vastness of the Pacific Ocean?" Following her encouragement, those pages reflected

13 Stephen Wright: "Pacific climate campaigner resigns as Tuvalu foreign minister", in: *Benar News*, 30/07/2023, https://www.benarnews.org/english/news/pacific/tuvalu-climate-change-spokesman-simon-kofe-resigns-07302023232405.html (14/04/2025).

on spaces that could potentially preserve South Pacific culture(s) and heritage(s) digitally, allowing Pacific Islanders to re-sense their homeland once it ceases to exist in the wake of climate change. Even though Tuvalu, *First Digital Nation* is not accessible yet, such a virtual space imagines ways of preventing a rupture and a loss of cultural, social, legal and civic identities that are inextricably tied to a disappearing geographic area. *Tuvalu, First Digital Nation* emerged from the eagerness of the Tuvaluan government to self-sufficiently digitize social and embodied practices, ensuring the persistence of a cultural space for its citizens. With this, Tuvalu re-appropriates ongoing global debates on climate precarity and climate adaptation that are largely dominated by the Global North.[14] As Taukiei Kitara states, those discourses narrate only one possible outcome for atoll nations in times of climate change, dictating a devastating future in which South Pacific culture(s) and heritage(s) will be irretrievably lost if the global community fails to end climate crisis.[15] In this context, *Tuvalu, First Digital Nation* suggests a different approach by enabling South Pacific Islanders to re-imagine alternative futures for their nations.[16] And that might be what Aborina Tenanorake Stellmach reinforces with her question. She urges us to dwell on future(s), even if some of them might be uncertain.

14 Cf. Delf Rothe et al.: "Digital Tuvalu. State Sovereignty in a World of Climate Loss", in: *International Affairs*, 100 (2024), 4, 1491–1509, here 1491–1492. https://doi.org/10.1093/ia/iiae060

15 Cf. Rothe, "Digital Tuvalu", 1491–1492.

16 Cf. Rothe, "Digital Tuvalu", 1491–1492.